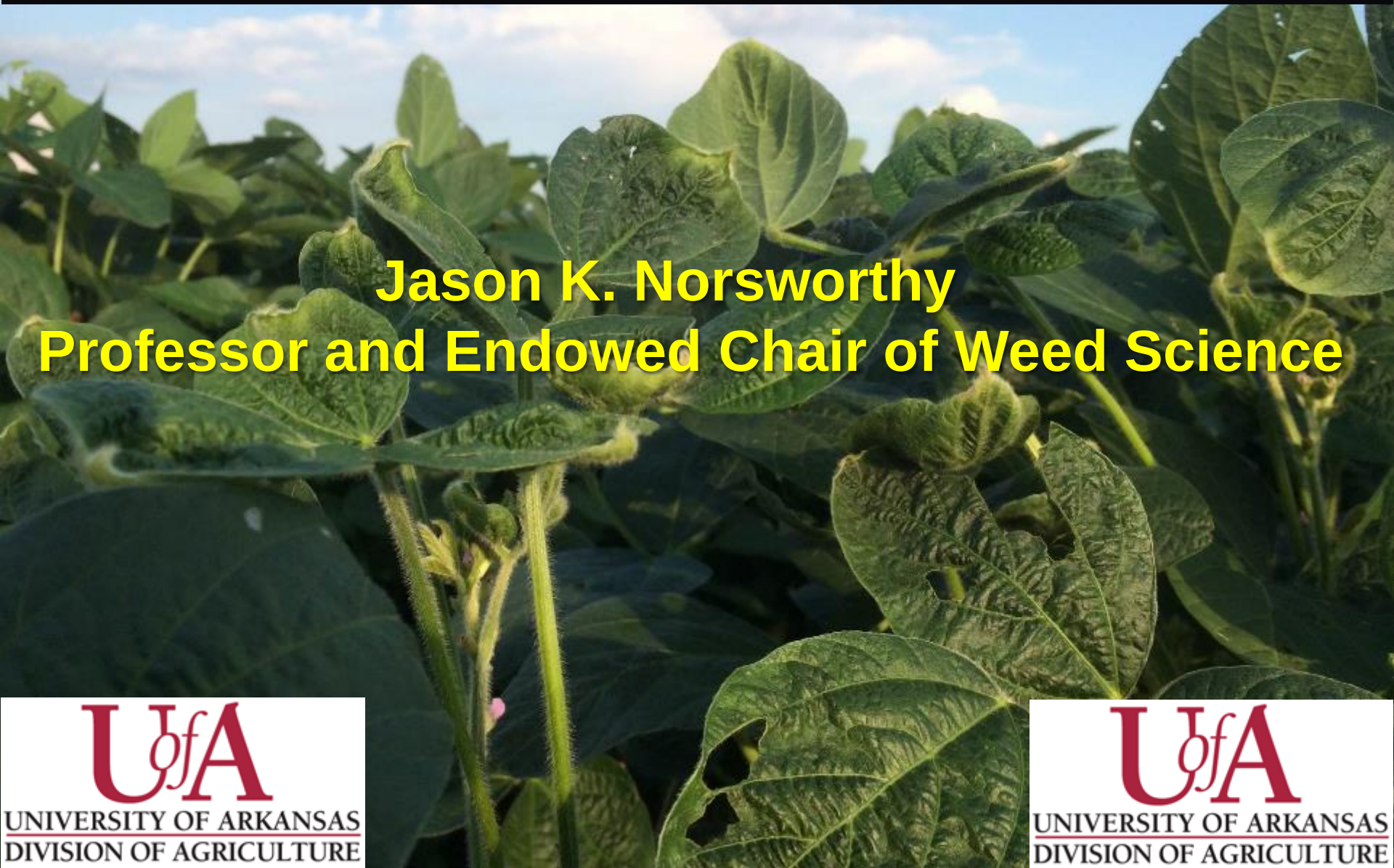
Managing Weeds Under a Microscope: Using Herbicides Effectively & Responsibly



Jason K. Norsworthy
Professor and Endowed Chair of Weed Science

UofA
UNIVERSITY OF ARKANSAS
DIVISION OF AGRICULTURE

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DIVISION OF AGRICULTURE

Insanity

Doing the same thing over and over again expecting different results

Albert Einstein

Palmer Amaranth

- ALS (Group 2)
- DNA (Group 3)
- Glyphosate (Group 9)
- PPO (Group 14)

You can’t grow Roundup Ready or conventional soybean in this field!!

Waterhemp

ALS, PPO, Glyphosate Resistance

BURNDOWN:
Durango (36 oz) + Valor (2 oz) + Prowl H_20 (1 pt)

POST:
Durango (48 oz)

POST:
Flexstar GT (44 oz) + Durango (16 oz)

POST:
Cobra (12 oz) + Resource (5 oz)

Interrow Cultivation

POST:
Ultra Blazer (1.5 pt)

Herbicide Cost: $94/A

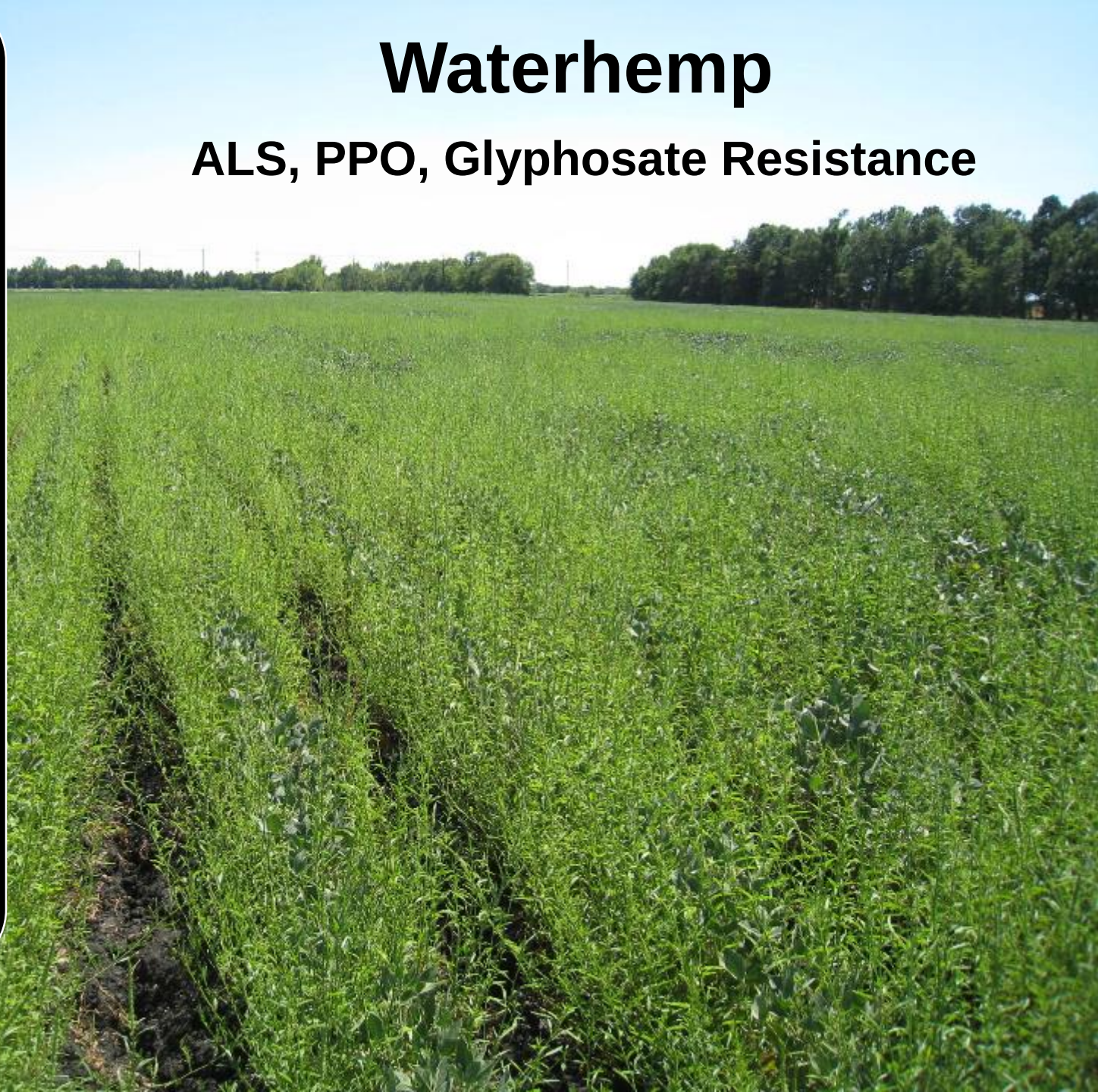


Photo: 8/5/12
L. Sandell

ACCEPTED
11/09/2016
Under the Federal Insecticide, Fungicide and Rodenticide Act as amended, for the pesticide registered under EPA Reg. No. 524-617

SUPPLEMENTAL LABELING

READ THE ENTIRE LABEL FOR XTENDIMAX™ WITH VAPORGRIP™ TECHNOLOGY BEFORE PROCEEDING WITH THE USE DIRECTIONS CONTAINED IN THIS SUPPLEMENTAL LABELING.

When using XtendiMax™ With VaporGrip™ Technology as permitted according to this supplemental labeling, read and follow all applicable directions, restrictions, and precautions on the container label and booklet provided with the product container and on this supplemental labeling. This supplemental labeling must be in the possession of the user at the time of pesticide application.

This supplemental label expires on 11/09/2018 and must not be used or distributed after this date.

Label expires November 9, 2018

EPA Reg. No. 524-617

GROUP	4	HERBICIDE

FOR PREEMERGENCE AND POSTEMERGENCE USE ON ROUNDUP READY 2 XTEND® SOYBEANS

Keep out of reach of children

CAUTION!

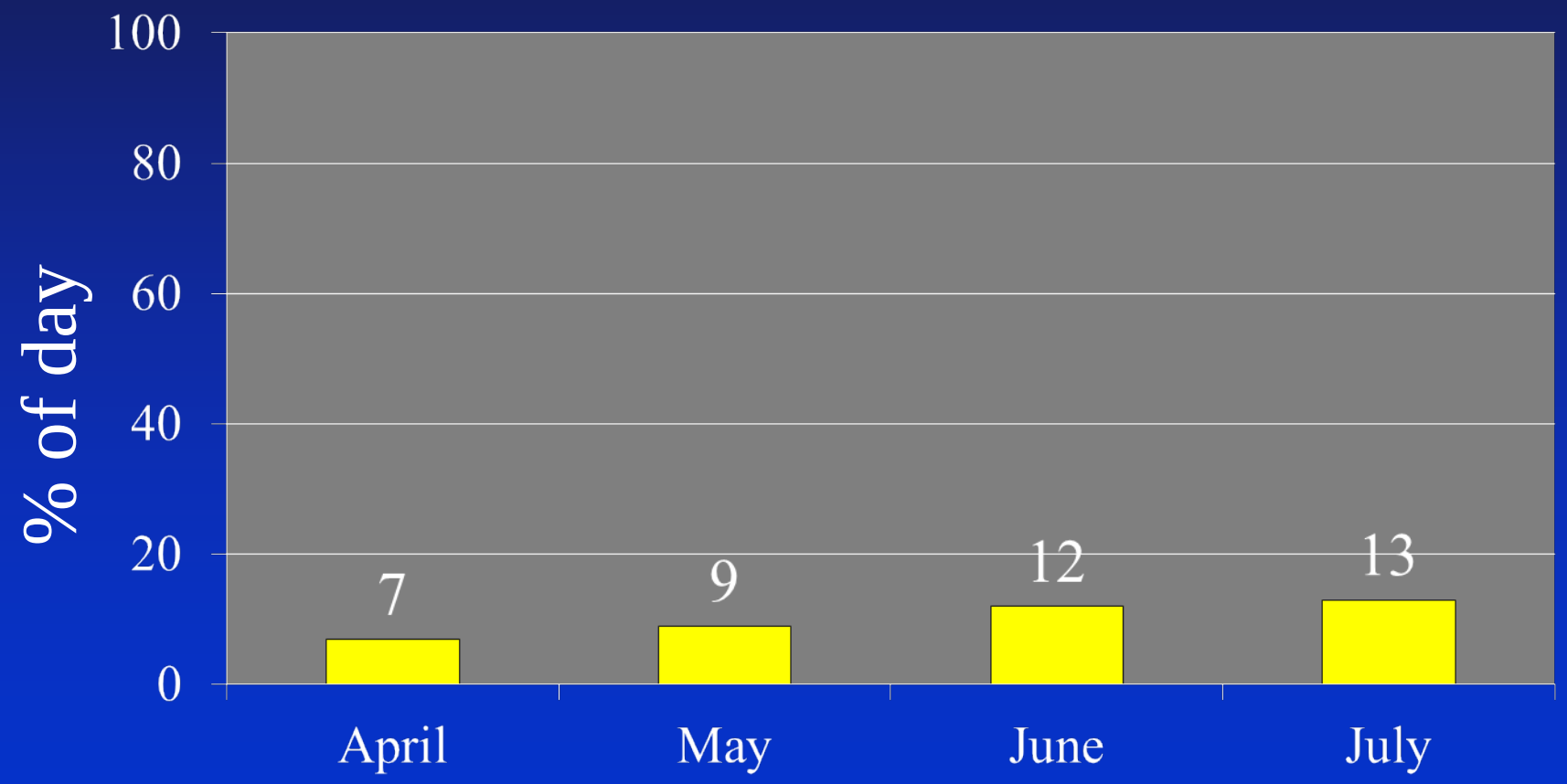
In case of an emergency involving this product, call collect, day or night, 314-694-4000.

Bollgard II®, Roundup Ready®, Roundup Ready 2 Xtend®, XtendiMax™, XtendFlex® and VaporGrip™ are trademarks of Monsanto Technology LLC. All other trademarks are the property of their respective owners.

Restrictions on the XtendiMax Label that Contradict Resistance Management

1. Wind speed (3 to 10 mph)
2. Ground application only
3. Can’t spray if rain is in 24 hour forecast
4. Only TTI 11004 nozzle - optimized for drift reduction but not weed control
5. No tank-mixtures currently approved
6. Two buffers – Sensitive area, Susceptible crop

Wind Speed 3-10 mph
(Eastern Arkansas 2010-2012)
7:00 AM to 7:00 PM; 5 min readings



- Does not include field conditions not suitable for ground applications

BASF
We create chemistry

Group 4 Herbicide

Engenia™

Herbicide

For weed control in asparagus; conservation reserve programs (CRP); corn; cotton; fallow cropland; farmstead turf (noncropland) and sod farms; grass grown for seed; pasture, hay, rangeland, and farmstead (noncropland); proso millet; small grain; sorghum; soybean; and sugarcane

Active Ingredient*:

N,N-Bis-(3-aminopropyl)methylamine salt of 3,6-dichloro-o-anisic acid	60.8%
Other Ingredients:	39.2%
Total:	100.0%

*Contains 48.38% dicamba (5 pounds acid equivalent per gallon or 600 grams per liter)

EPA Reg. No. 7969-345 **EPA Est. No.**

KEEP OUT OF REACH OF CHILDREN

CAUTION/PRECAUCION

Si usted no entiende la etiqueta, busque a alguien para que se la explique a usted en detalle. (If you do not understand the label, find someone to explain it to you in detail.)

See inside for complete **First Aid, Precautionary Statements, Directions For Use, Conditions of Sale and Warranty**, and state-specific crop and/or use site restrictions.

In case of an emergency endangering life or property involving this product, call day or night 1-800-832-HELP (4357).

Net Contents:

BASF Corporation
26 Davis Drive, Research Triangle Park, NC 27709

PENDING STATE REGISTRATIONS

Engenia™ Herbicide
Direct Injection Program

BASF
We create chemistry

For Every 12.8 fl oz of Engenia you use, you earn $1 back on a Direct Injection System!

- Earn up to $10,000 per direct injection unit
- 12.8 fl oz of Engenia = $1 on Direct Injection
- Given up to 3 years to reach the max rebate
- You purchase the unit and supply BASF with an invoice
- Paid on POS data

Will Xtend crops be our first opportunity to use dicamba in a row crop?

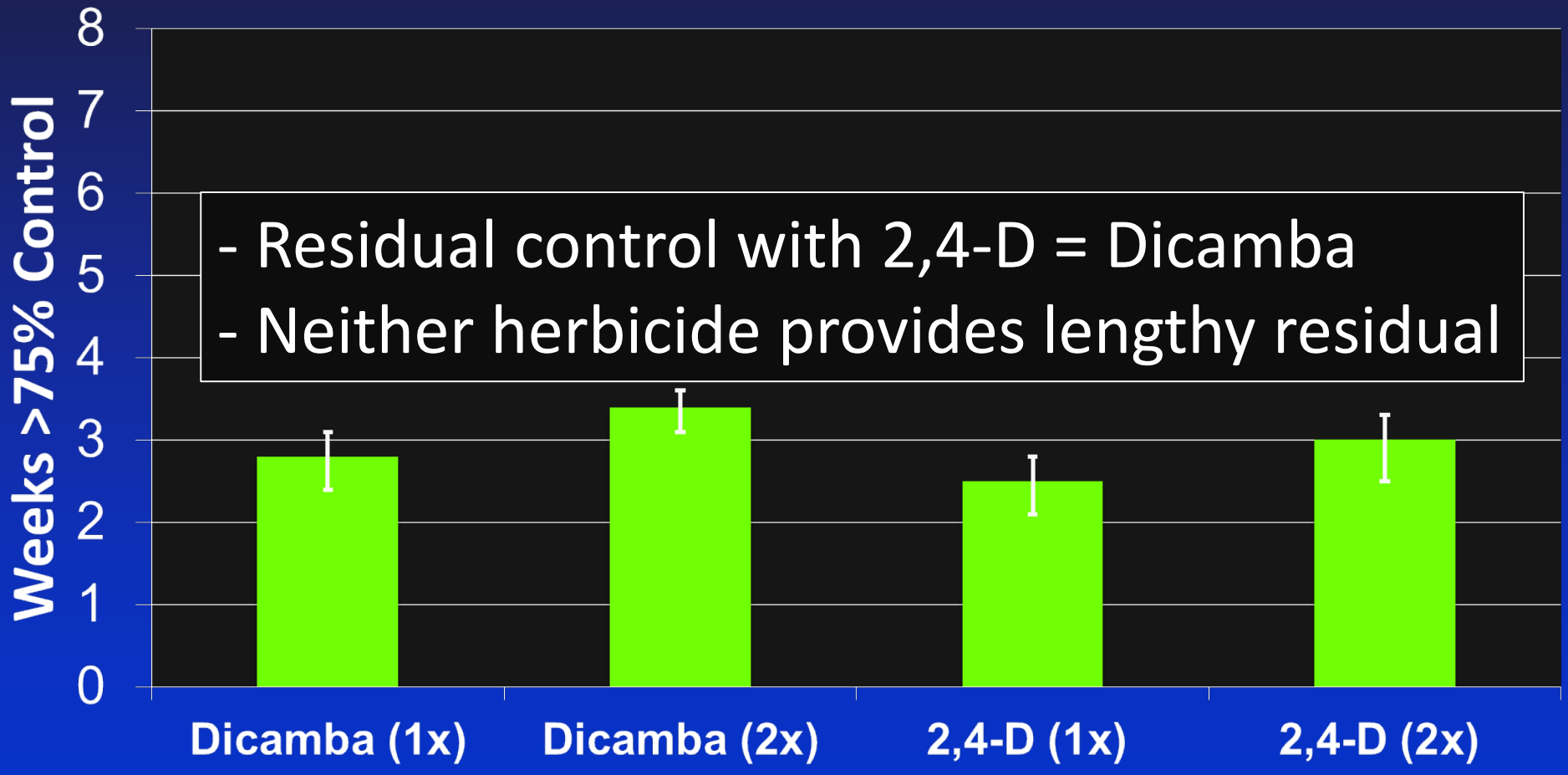
- Corn?

How much residual weed control does dicamba provide in corn?

Has dicamba been promoted as a residual herbicide in corn?

Length of Residual Palmer amaranth Control

10 site years



- Residual control with 2,4-D = Dicamba
- Neither herbicide provides lengthy residual

Last herbicide application: DiFlexx

Sublethal Selection for Dicamba-resistant Palmer Amaranth

16 oz/A Clarity

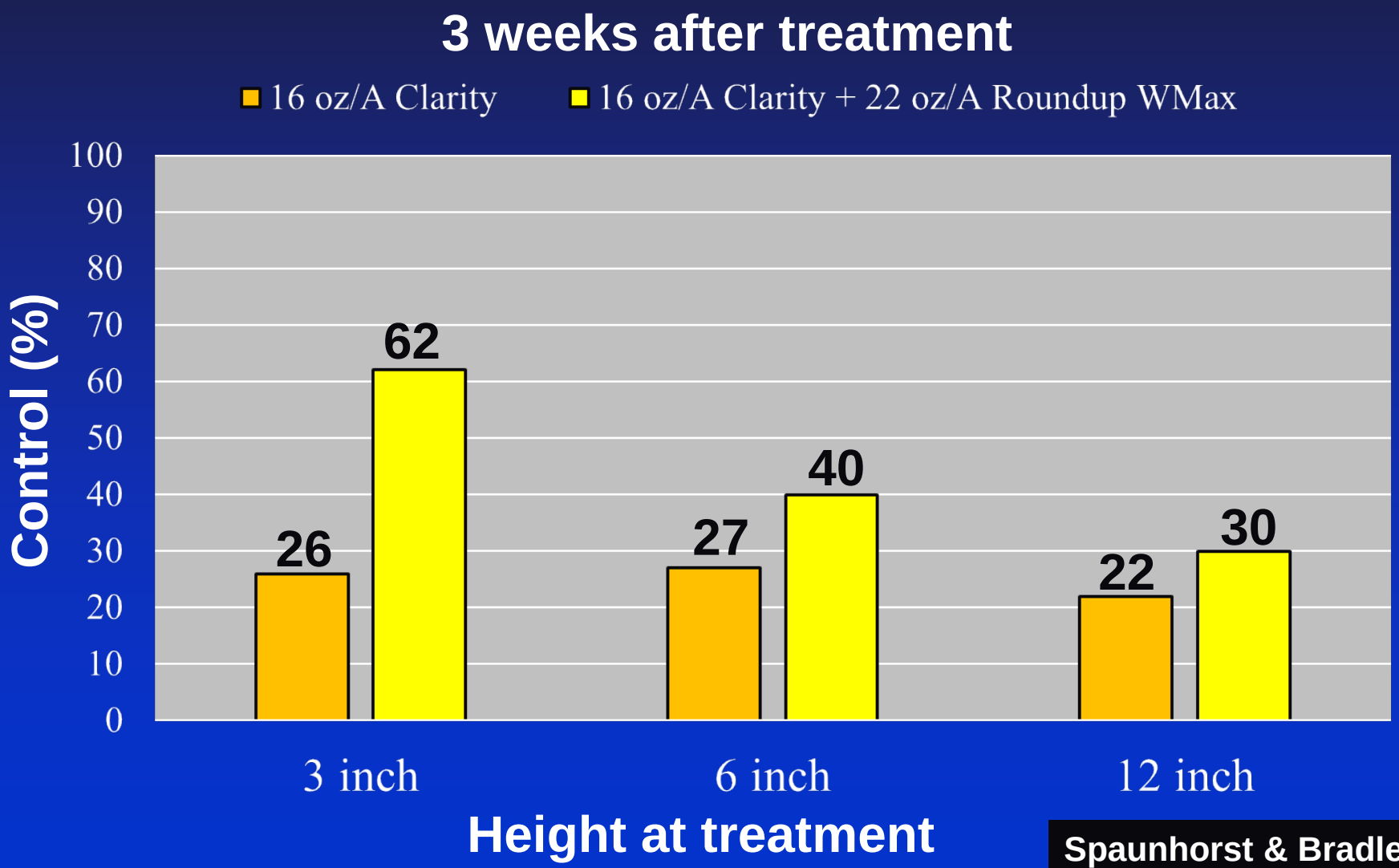
F_0 – Unselected Population

F_3 – Selected Population

Dicamba

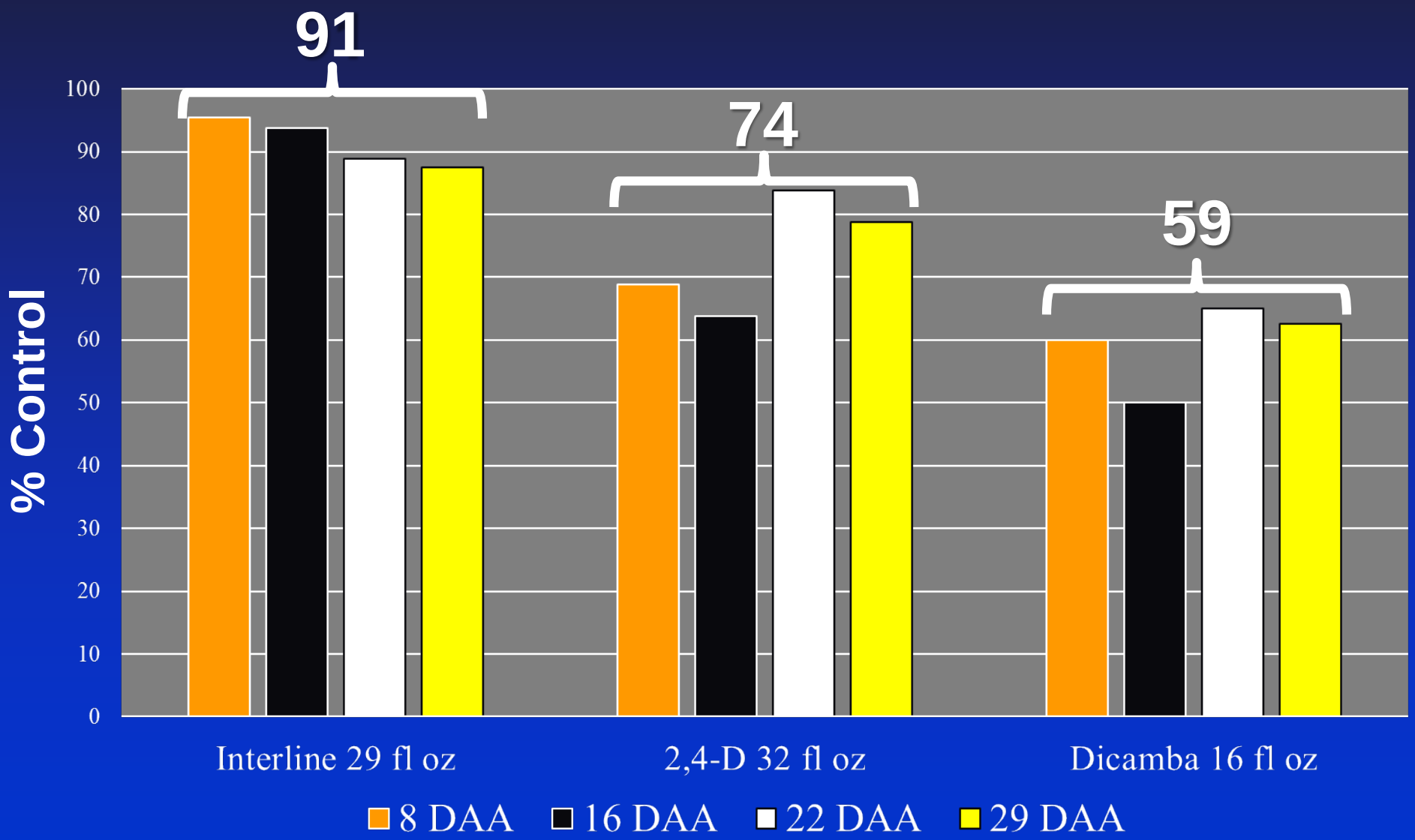
- 75% pigweed control if sprayed at labeled rates on 4 inch pigweed
- Repeat applications controlled 50 to 75% of the escapes
- Programs using PRE residuals and repeat dicamba applications can look good
- Going to struggle on glyphosate- & PPO-resistant populations
- Grower expectations higher than reality

Control of Glyphosate-Resistant Waterhemp with Dicamba



Spaunhorst & Bradley 2013

Palmer Amaranth Control (Fayetteville, AR)



1 pt/A Dual Magnum PRE
12.8 oz/A Engenia POST1
12.8 oz/A Engenia POST2

Live and Dead Plants 21 DAT

Must be investigated by the company for possible resistance

Crawfordsville, AR

16 oz/A Clarity

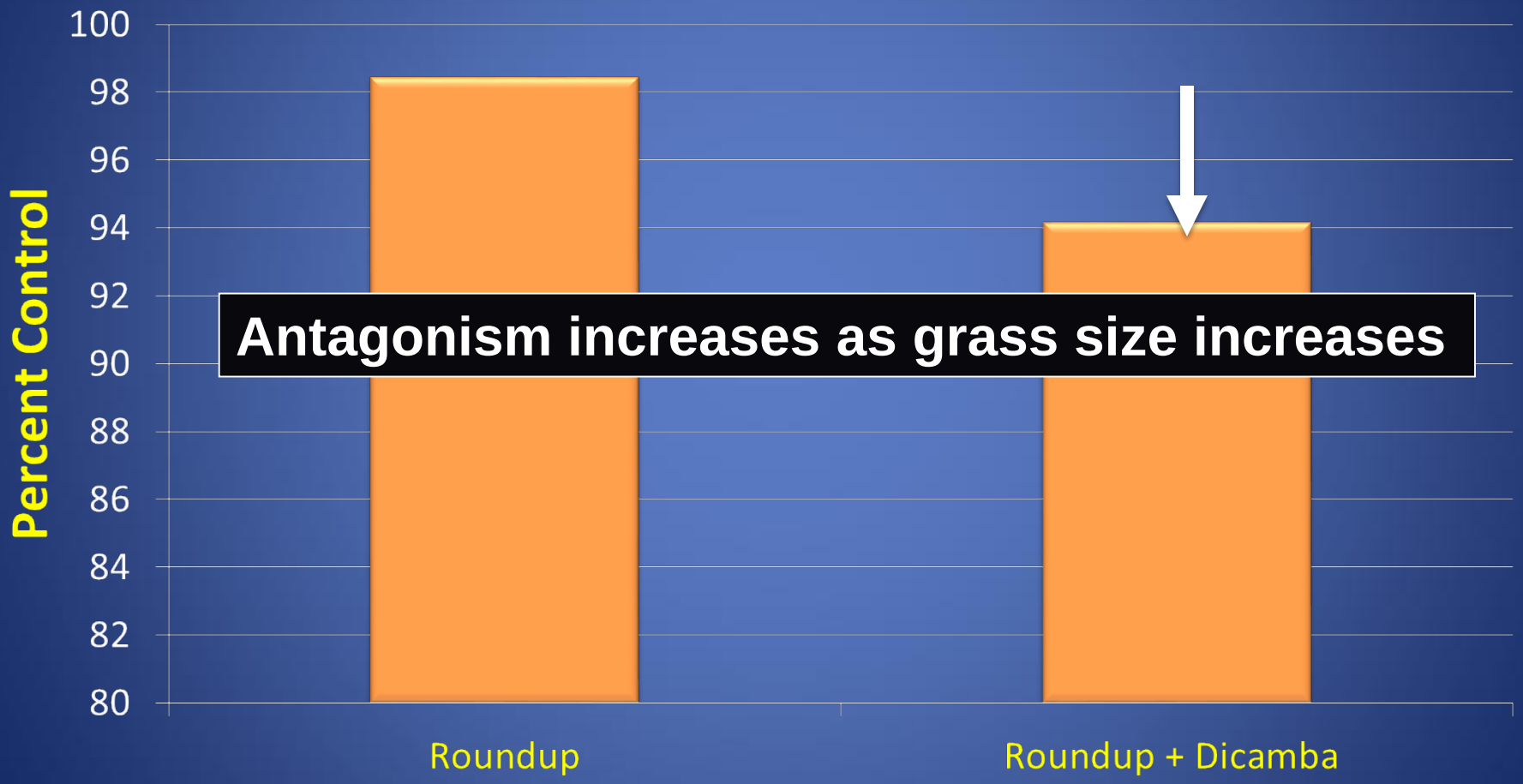
29 oz/A Liberty

2.5 oz/A Zidua + 8 oz/A Tricor (metribuzin) PRE
29 oz/A Liberty + 32 oz/A Prefix POST

Glufosinate

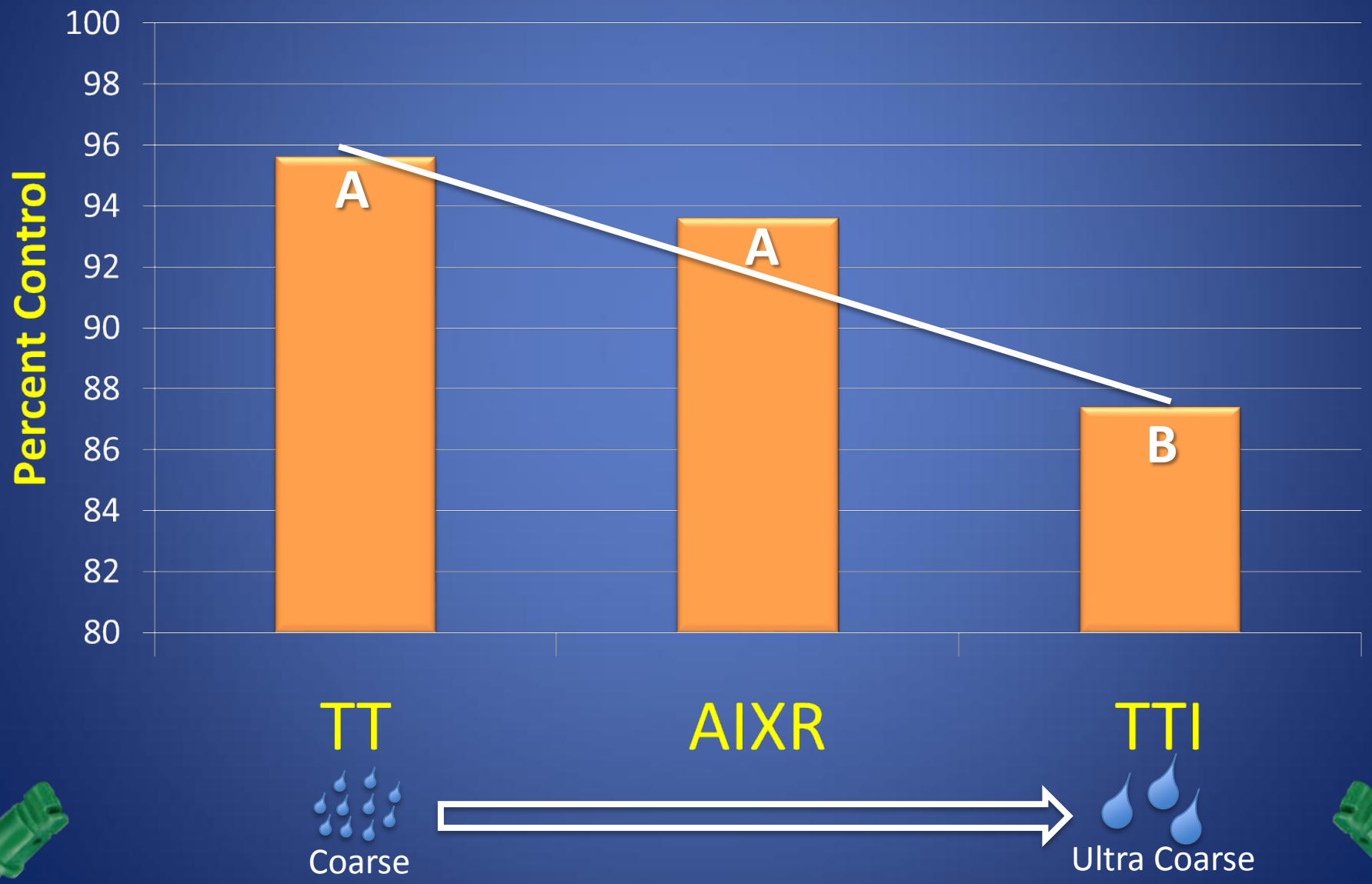
- Most effective postemergence option for glyphosate & PPO-resistant Palmer amaranth and waterhemp control in soybean
  - Apply prior to 4 inches
  - Needs to be in a program
    - Residual at planting
    - Tank-mix partner postemergence

Grass Control



Antagonism increases as grass size increases

Grass Control

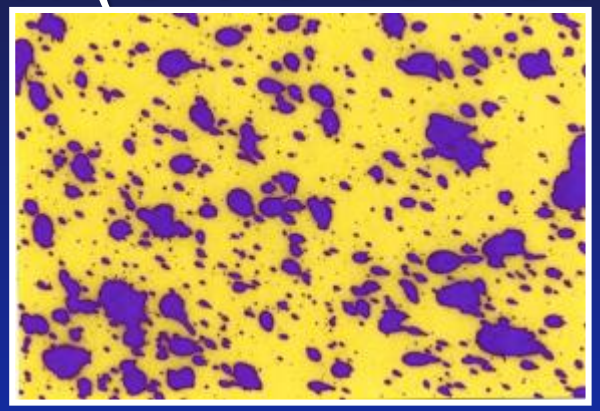
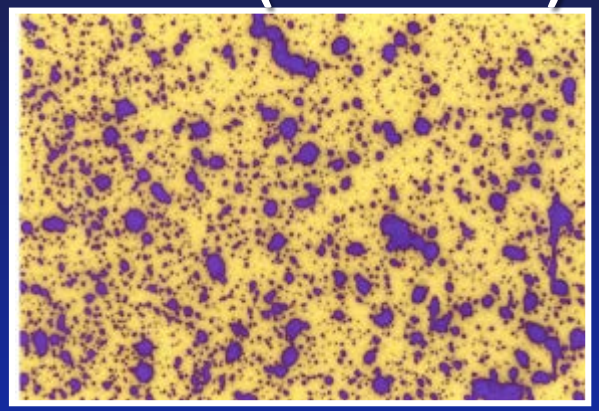
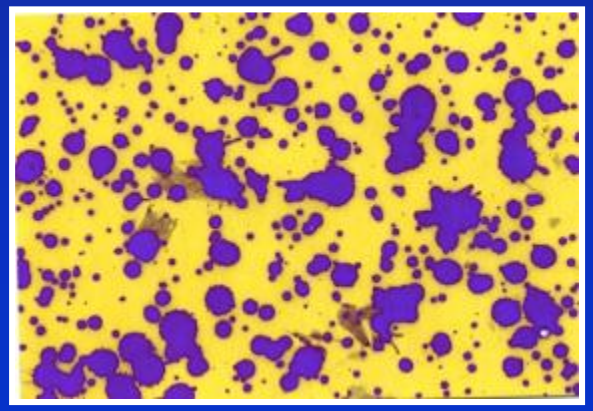
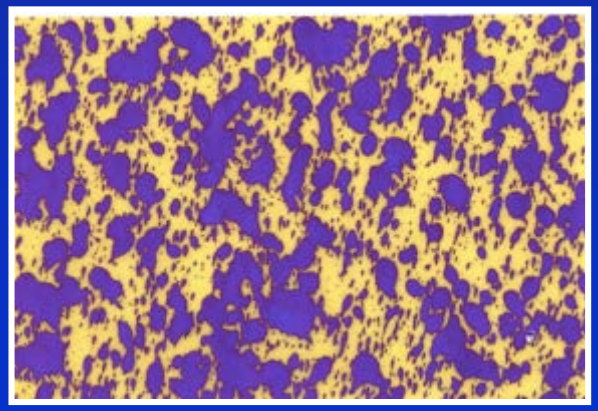


Roundup

Roundup + Dicamba

Perfect scenario for developing glyphosate-resistant grasses

% Spray Coverage

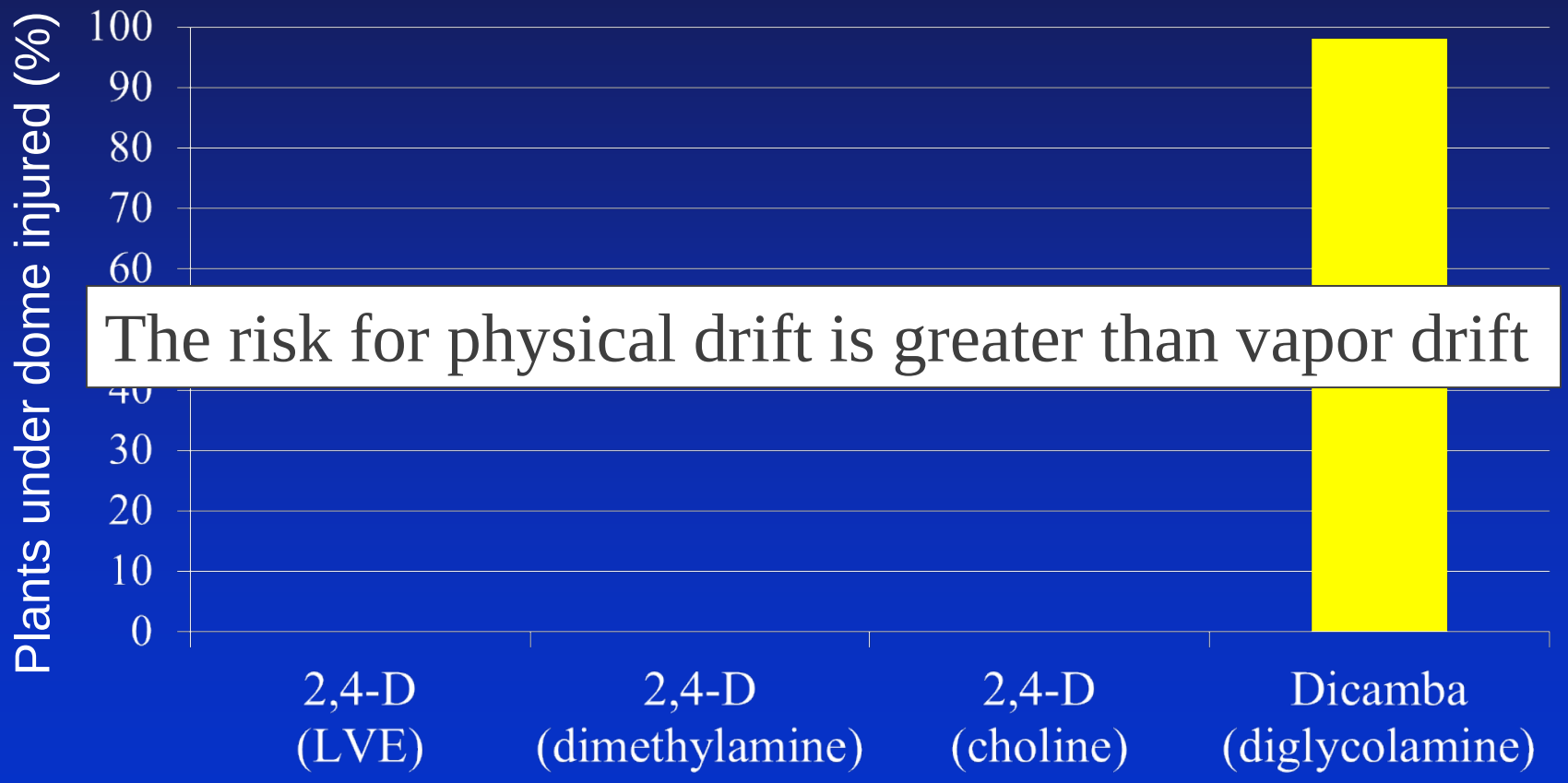
	TTI (Ultra Coarse)	AIXR (Coarse)
10 GPA	 39%	 69%
20 GPA	 42%	 75%

2,4-D and Dicamba Volatility Study

Artificial Comparison:

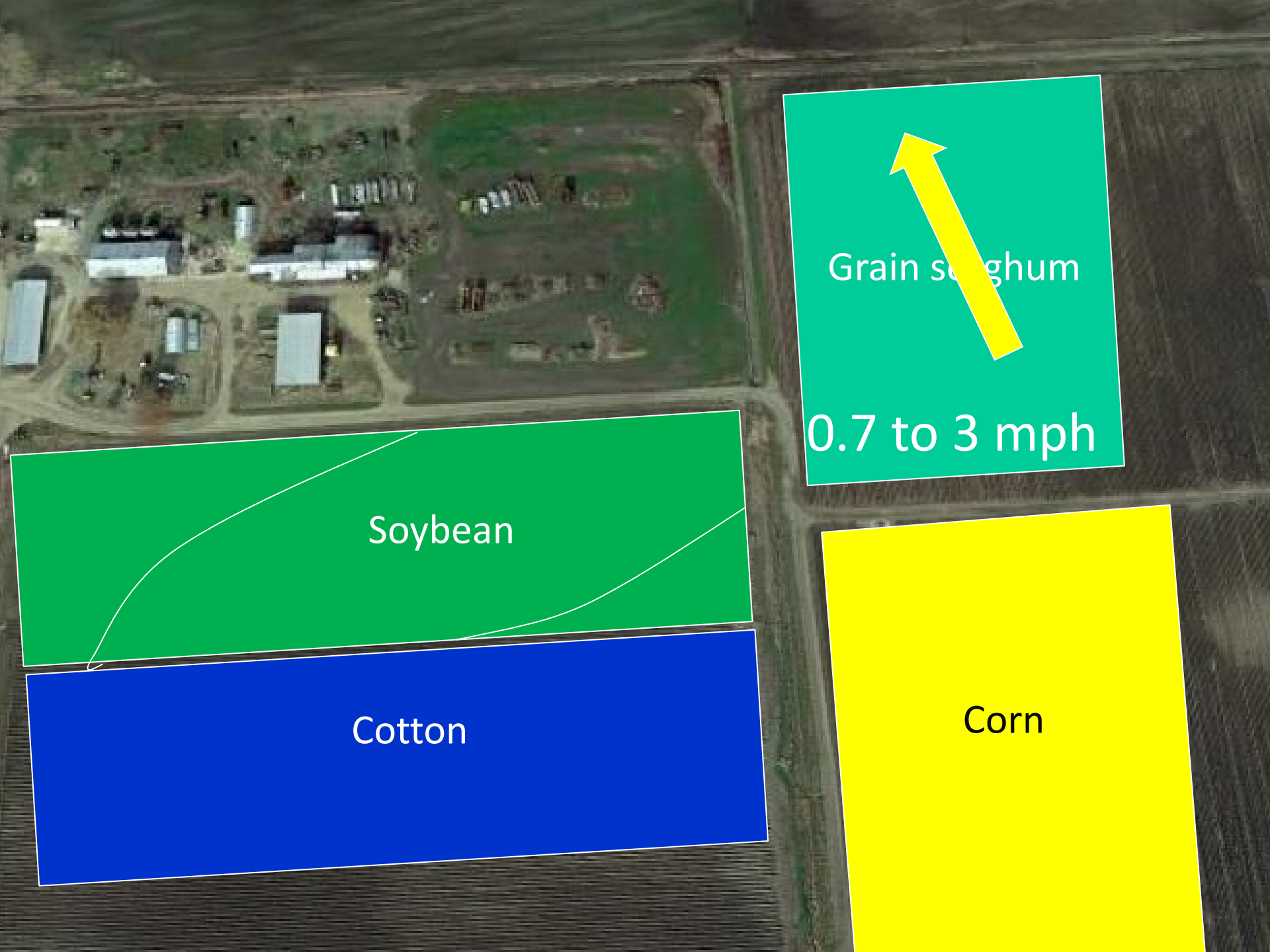
- Confined space
- High temp. & RH
- Relative comparison

Volatility Study (Soybean)

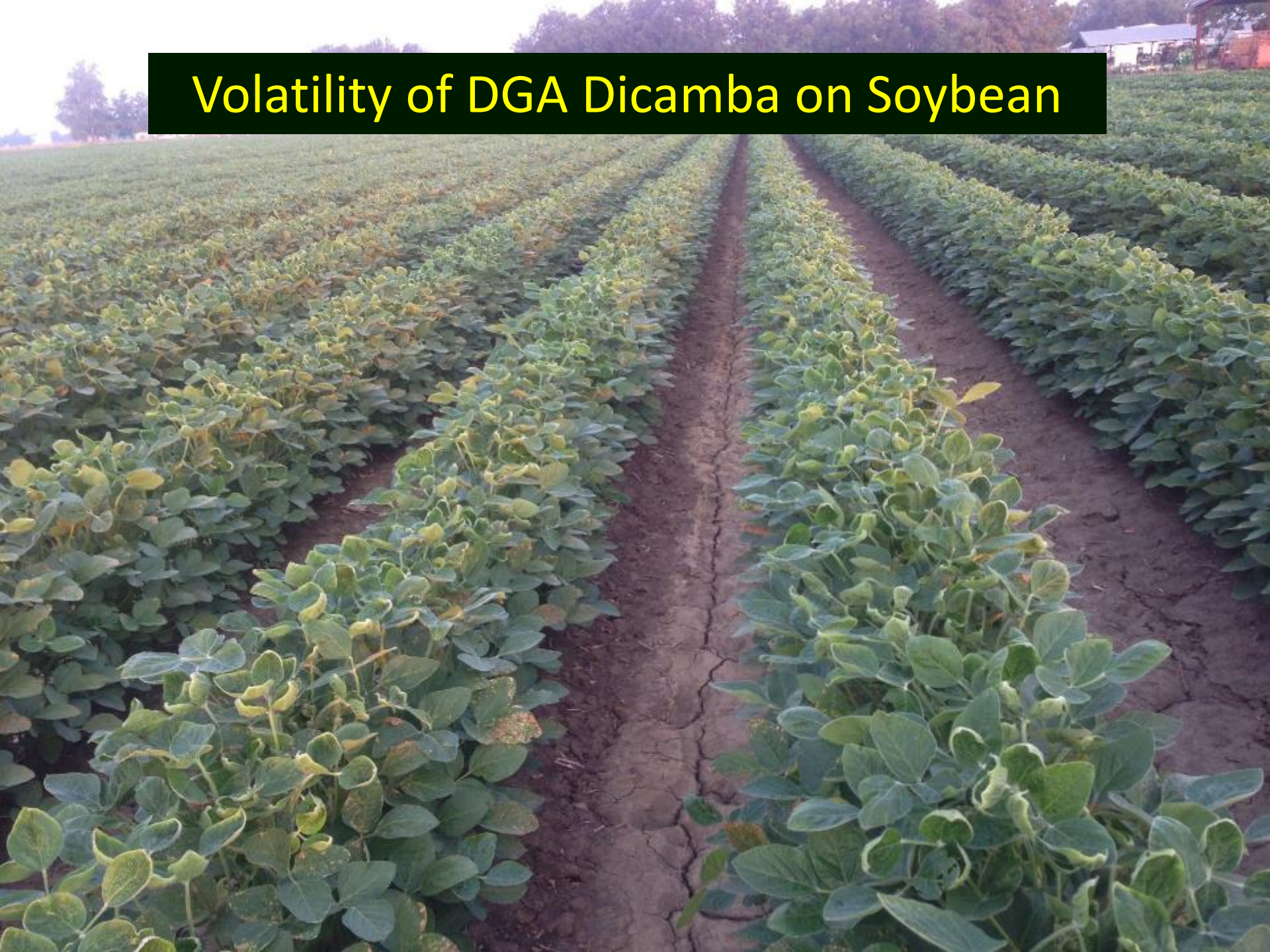


The risk for physical drift is greater than vapor drift

* All treatments contained glyphosate

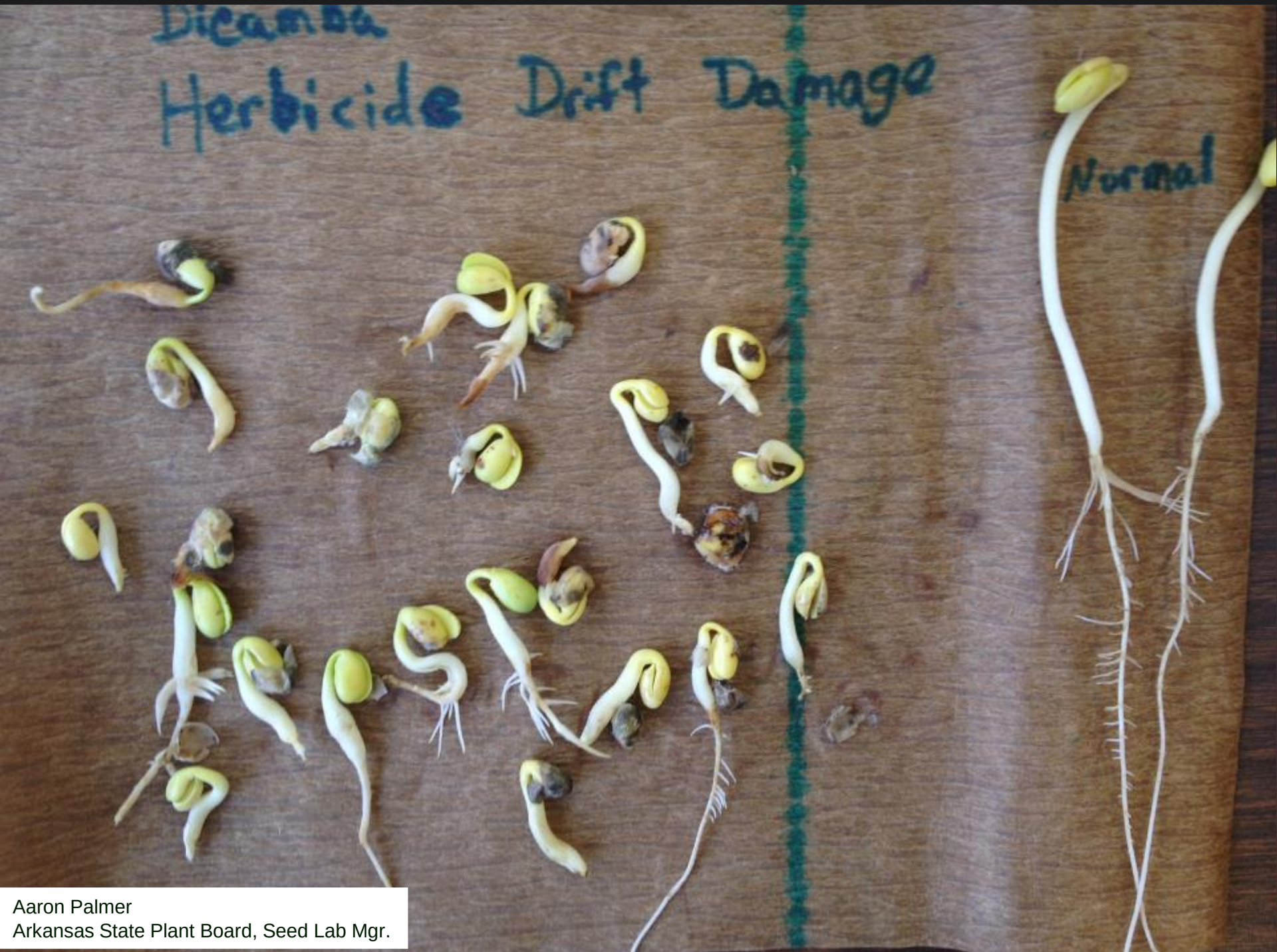

Grain sorghum
0.7 to 3 mph
Soybean
Cotton
Corn

Volatility of DGA Dicamba on Soybean



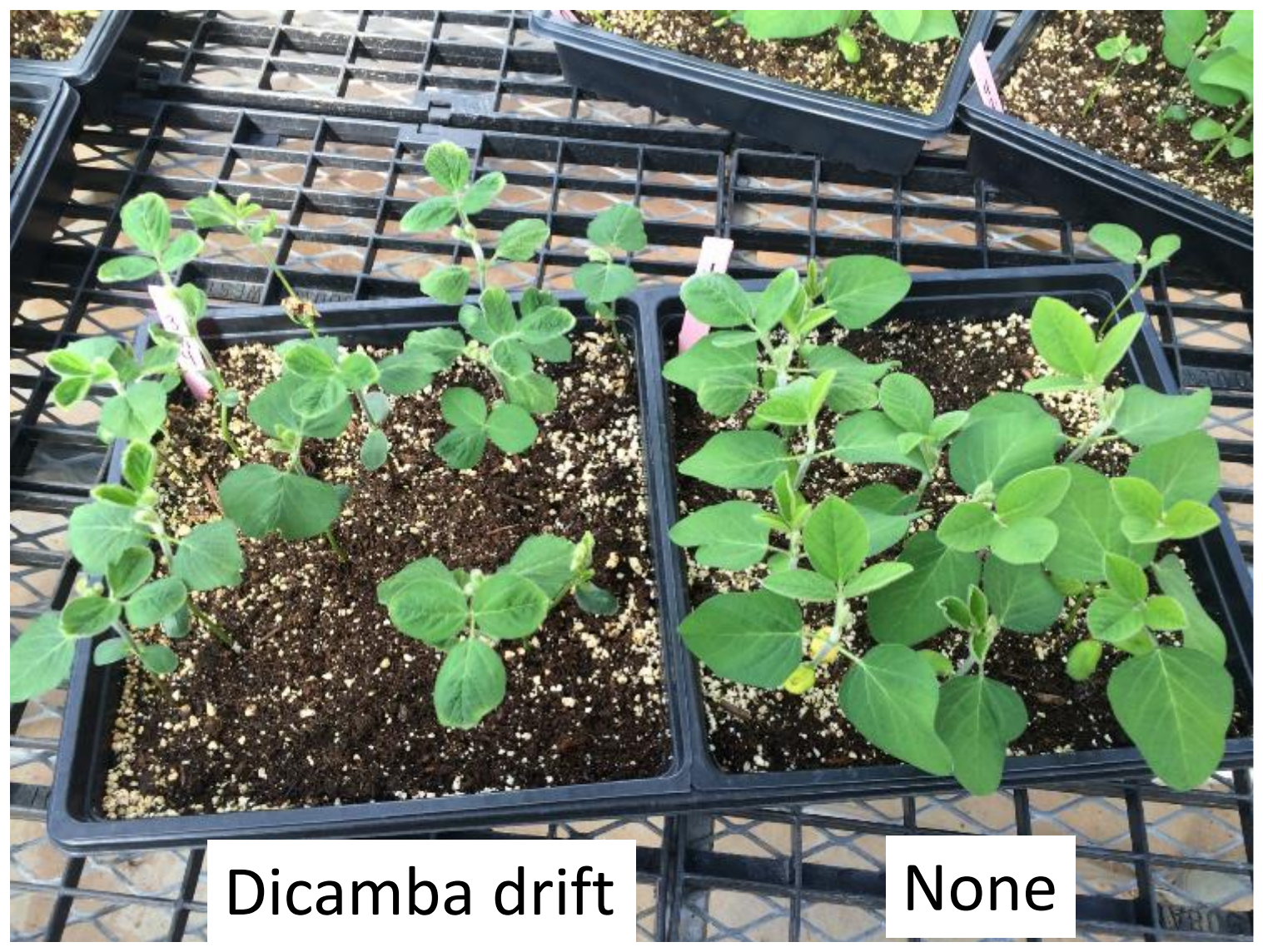
Pod Malformation

(Dicamba Drift During Reproductive Development)



Aaron Palmer
Arkansas State Plant Board, Seed Lab Mgr.

Offspring following dicamba drift



How far will particles go?

Droplet	Diameter (in μm)	Time to fall 5 ft	Travel distance in 3 mph wind
Fog	5	3,900 sec	8,000 ft
Very fine	20	125 sec	550 ft
Fine	100	5 sec	110 ft
Medium	240	3 sec	22 ft
Coarse	400	1 sec	4.2 ft
Fine rain	1,000	0.5 sec	5 ft

Source: *Herbicide Spray Drift*, NDSU Extension

Evaporation and Distance Traveled

Droplet Diameter (microns)	Terminal Velocity (ft/sec)	Time to Evaporate (sec)	Distance from nozzle (inches)
200	2.4	29.0	25

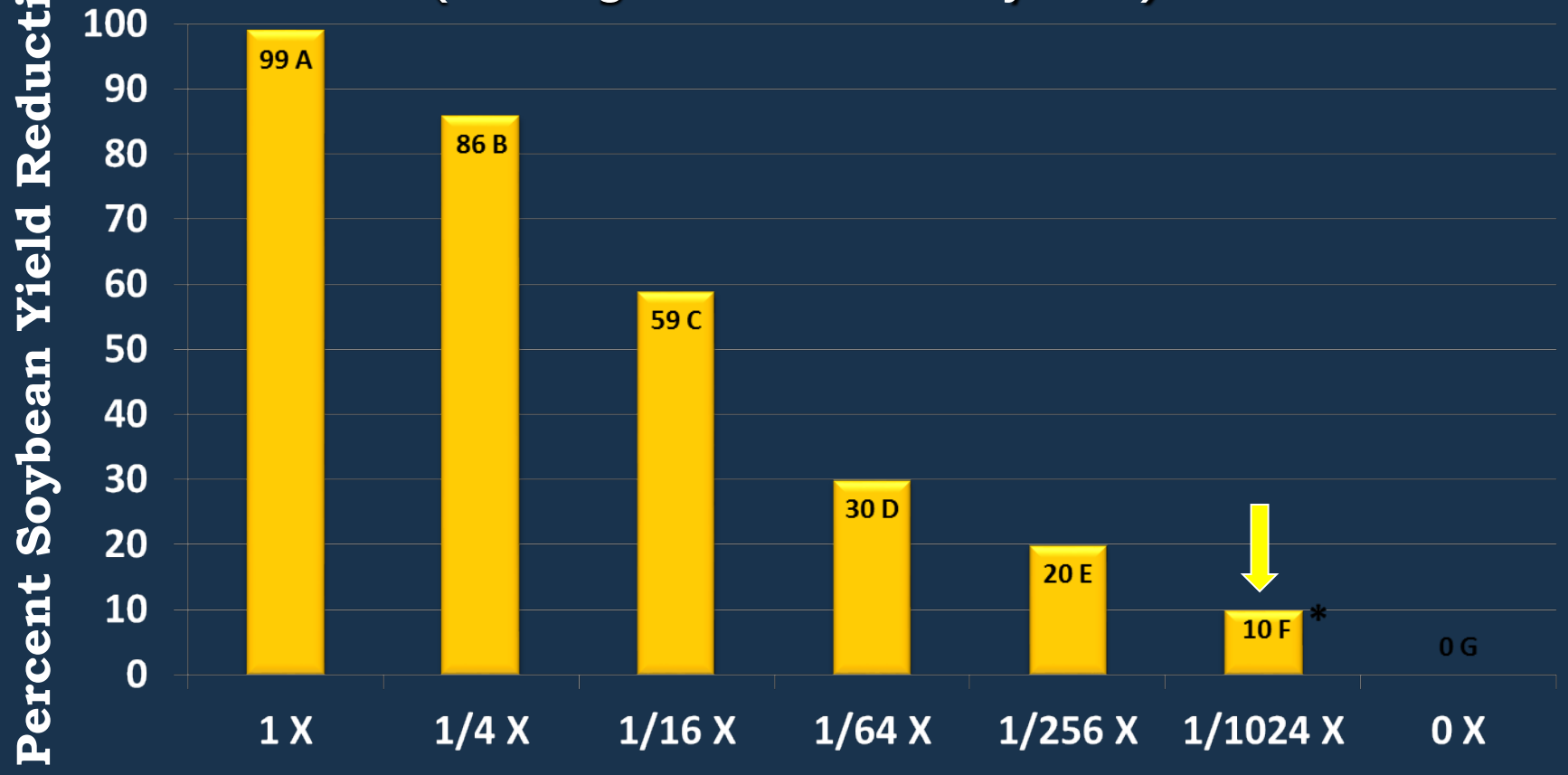
Drift research involving a single pass of a sprayer underestimates the risk for off-target movement!

Assumes: 90 F, 36% RH, 25 psi

Kansas State University MF-2444

Soybean Yield Reductions By Dicamba Application Rate

(Averaged Over 6 site years)



Fraction of dicamba rate applied:
1 X = 0.5 lb ae/A or 1pt/A Clarity sprayed at R1

Dicamba Drift from Cotton

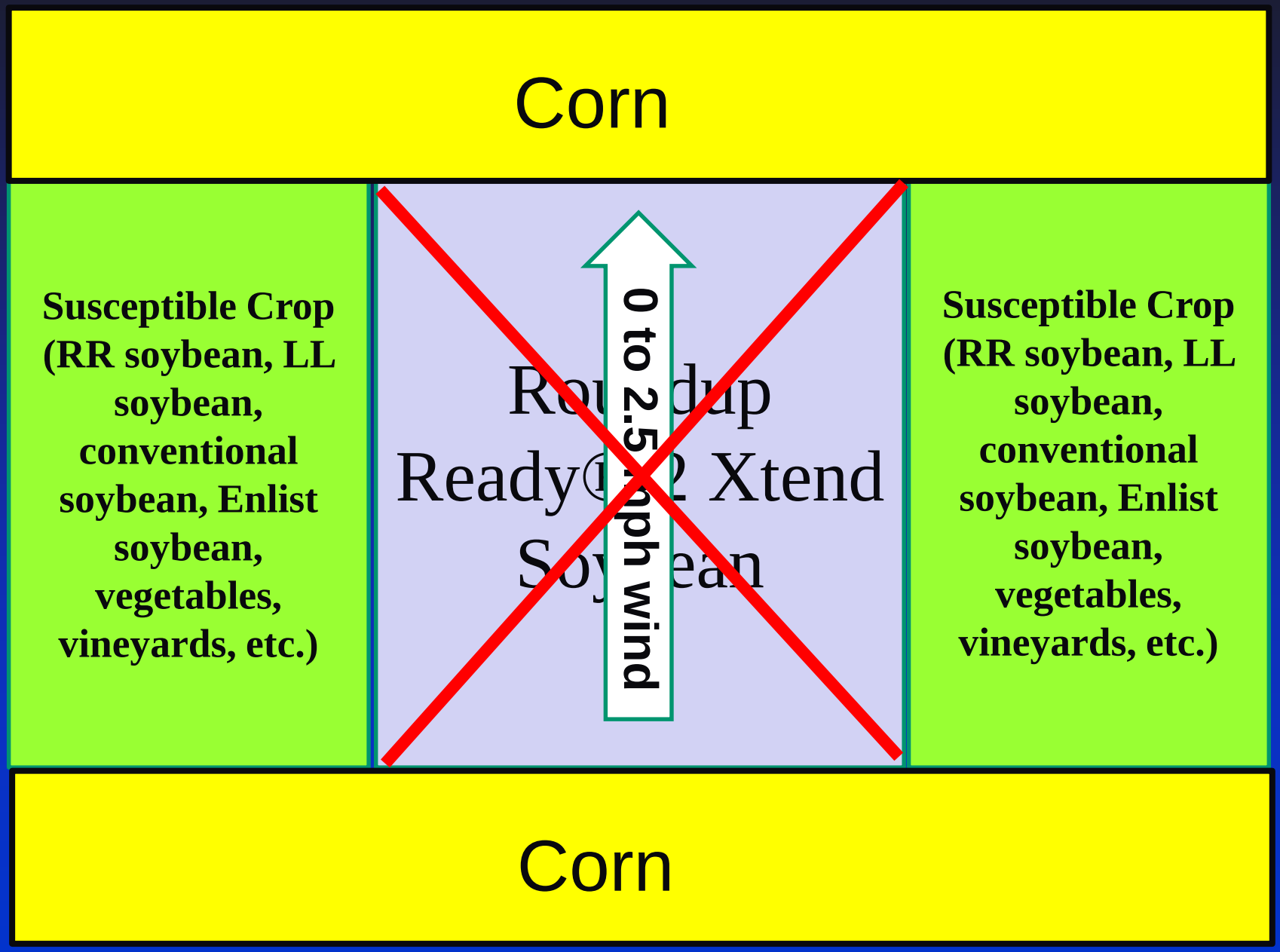
A Year in Review (2016)

- 13 states reported dicamba drift from Xtend fields
- Approximately 300,000 acres of soybean damaged in Midsouth
- Over 175 formal complaints in AR, TN, MO Bootheel
- Damage to peaches, tomatoes, peas, peanuts, watermelons, cantaloupes

Arkansas Restrictions on Dicamba

- Dicamba acid and DMA salt formulations – Banned
- DGA and NA salt formulations (Clarity, XtendiMax, Status) – Can't be applied after April 15
- BAPMA salt formulation (Engenia) – 100 ft buffer on all four sides and ¼ mile downwind toward sensitive crops

XtendiMax Application Requirements



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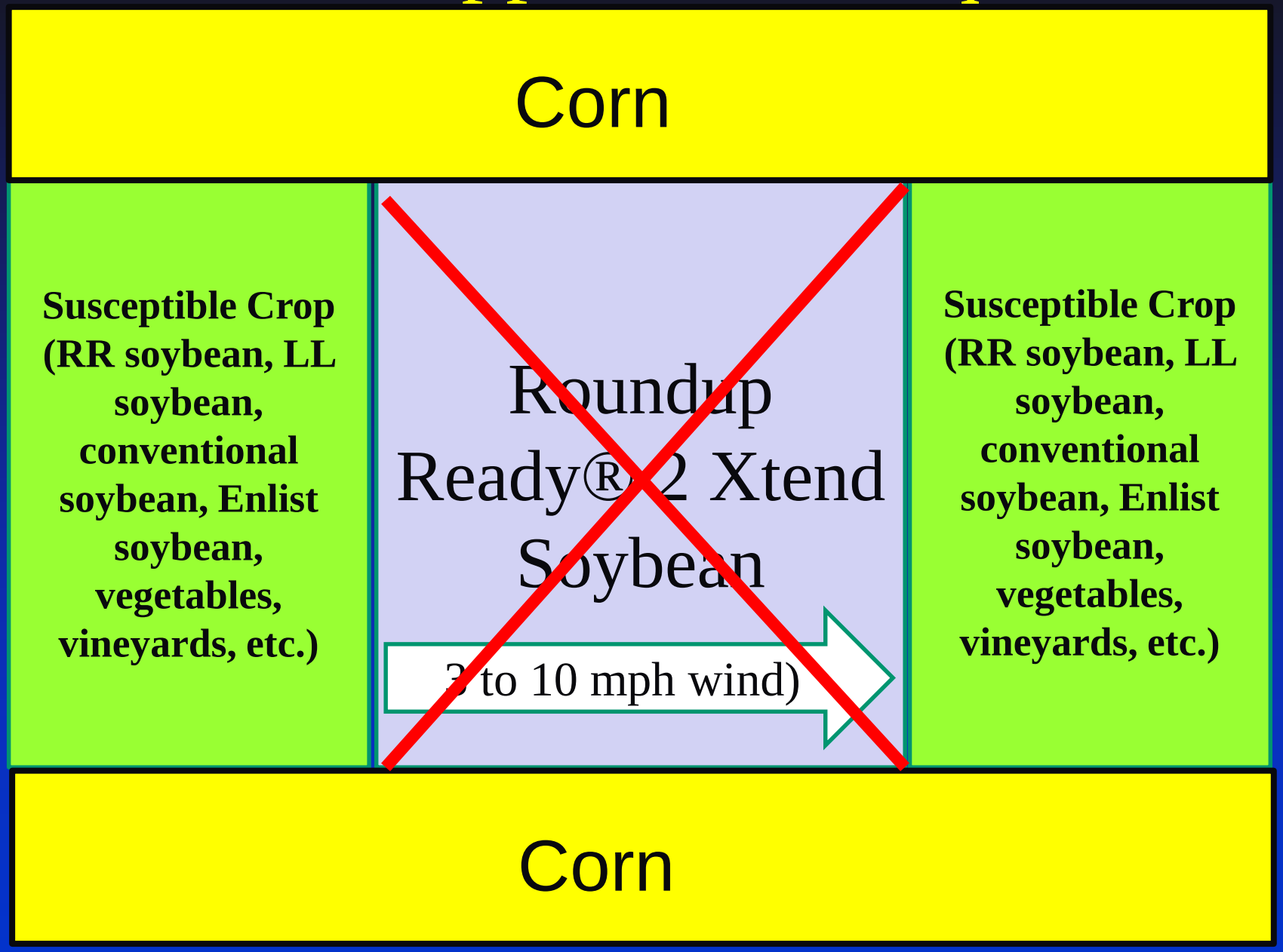

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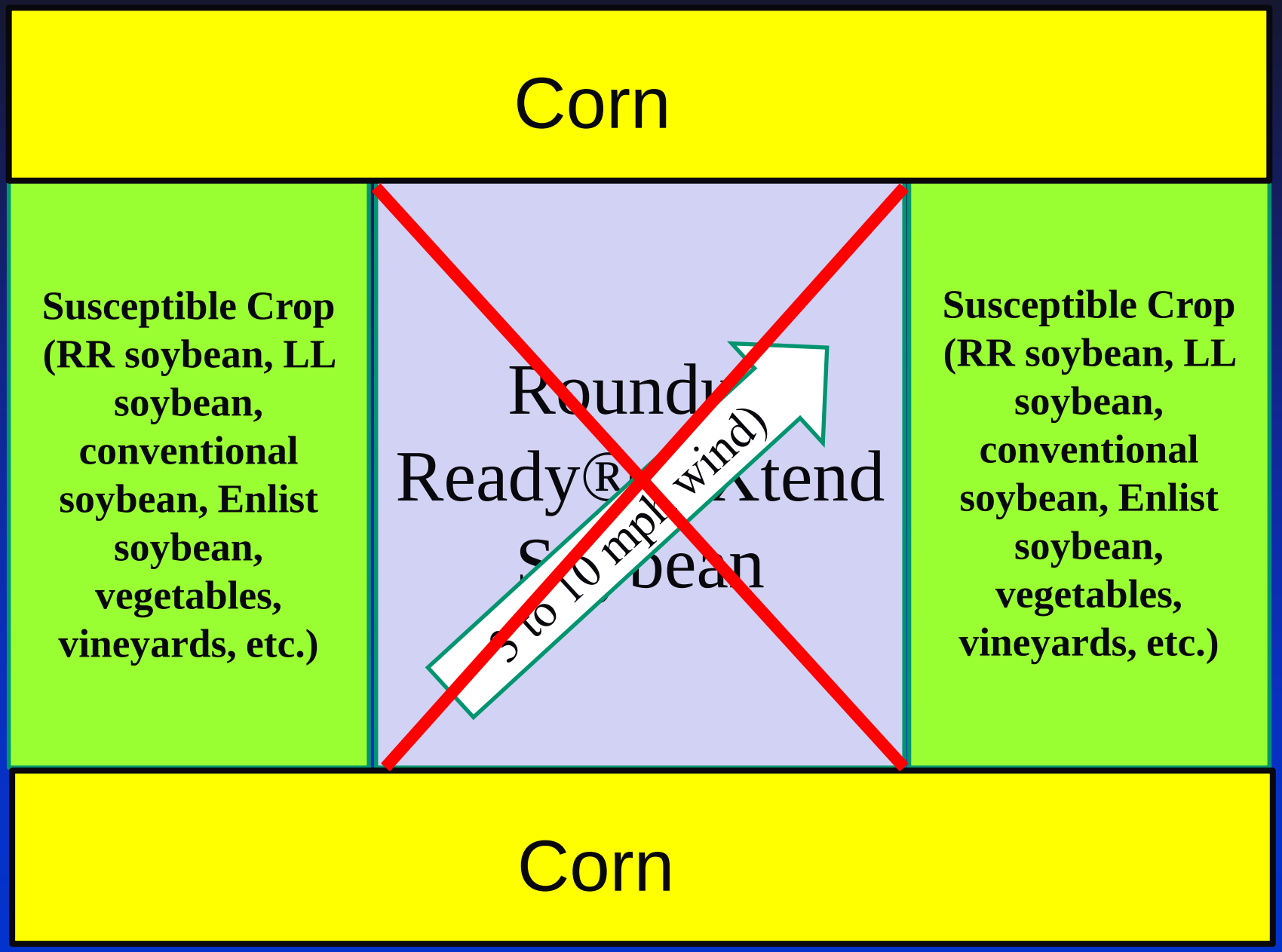

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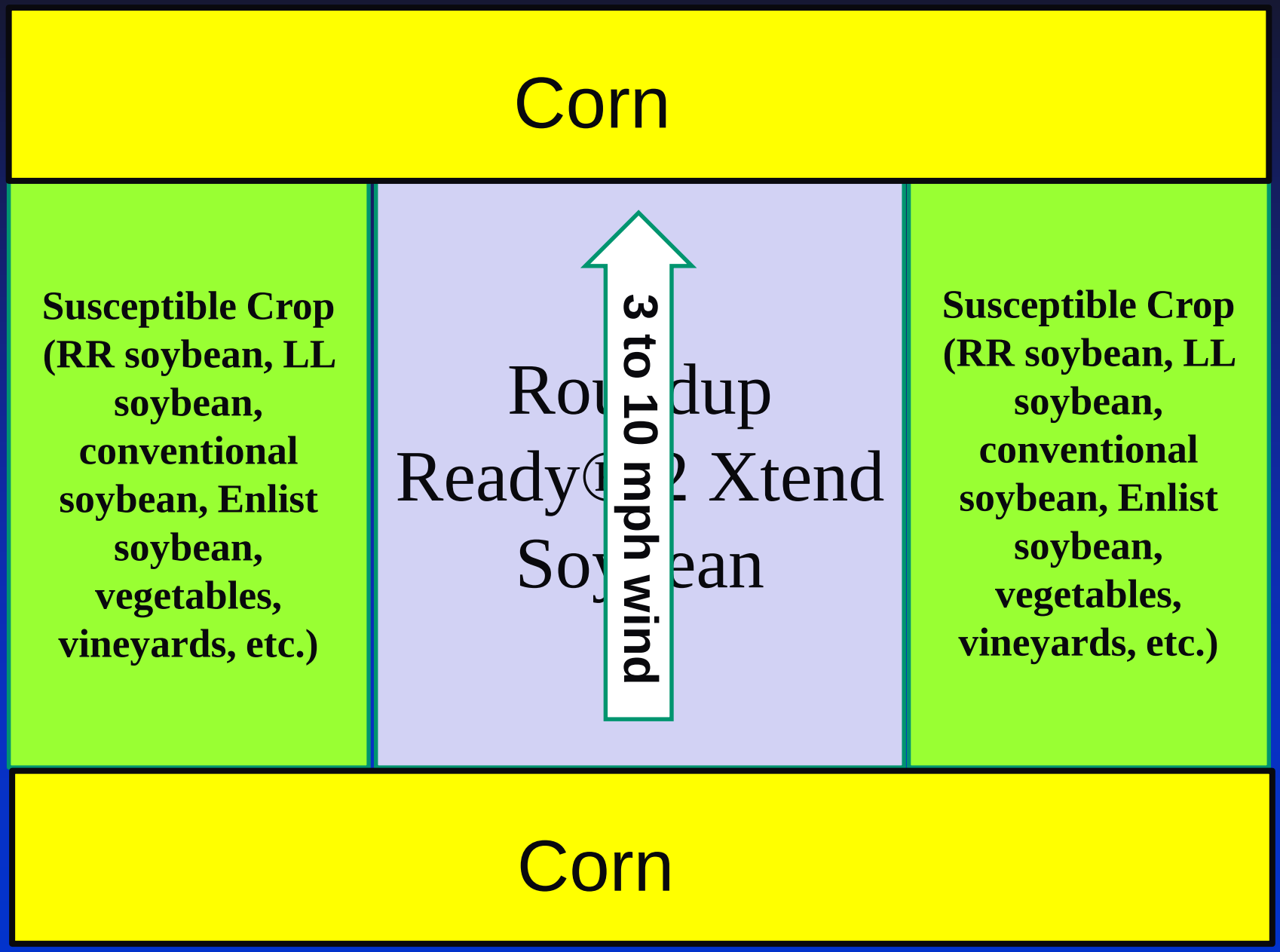

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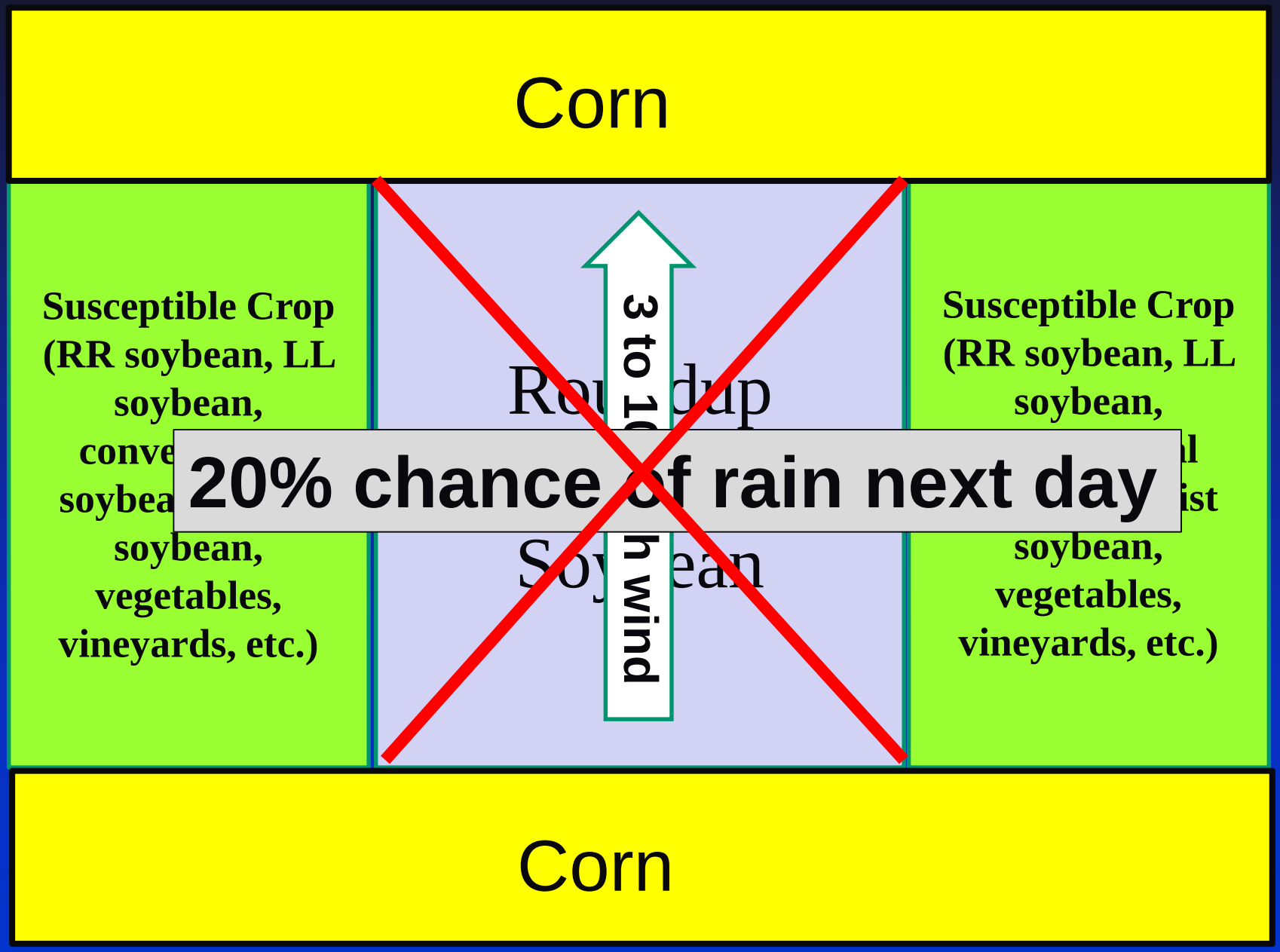

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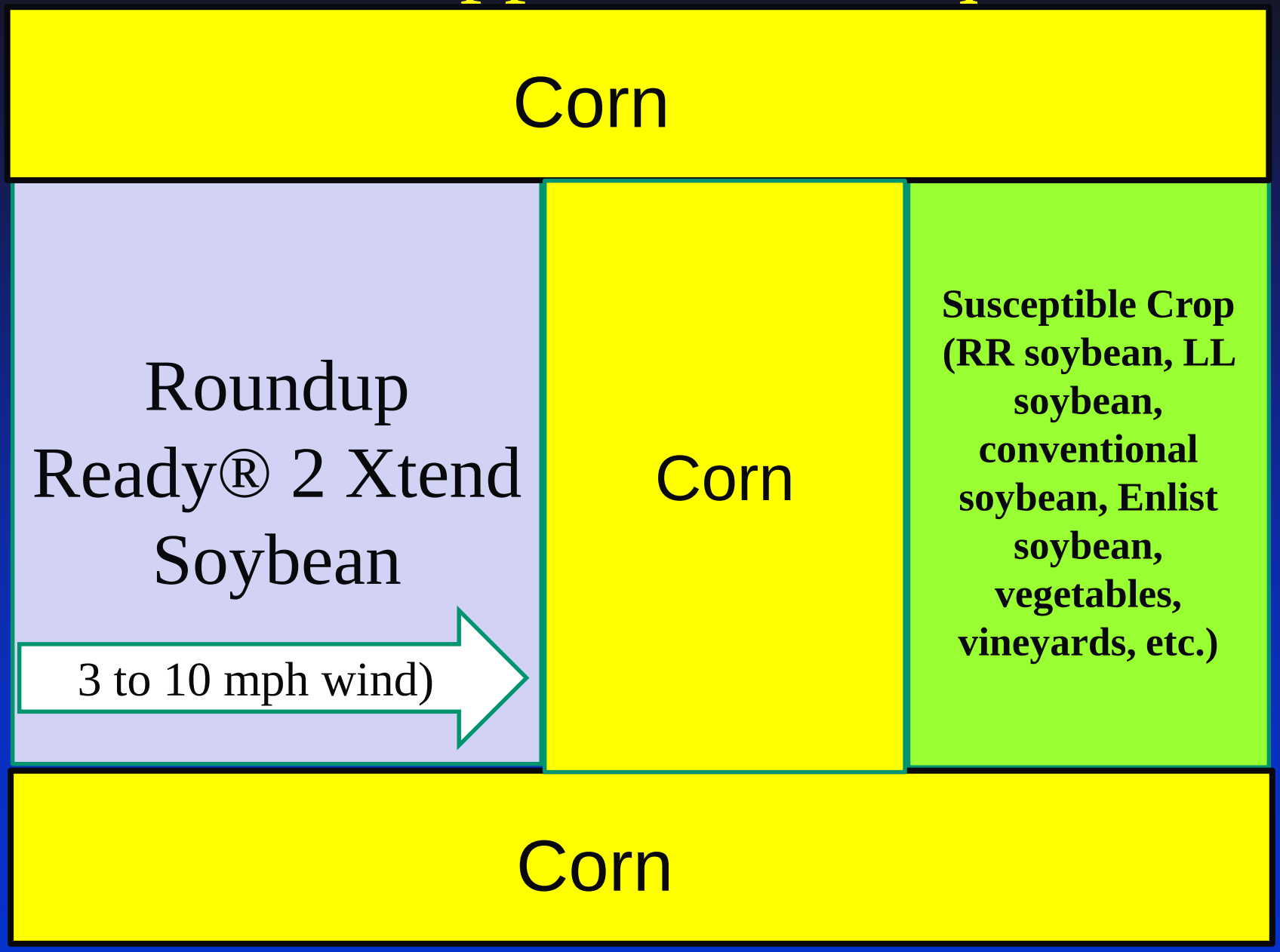

XtendiMax Application Requirements

Corn

Sensitive Area (field edge, grass strip, tree line)

Susceptible Crop (RR soybean, LL soybean, conventional soybean, Enlist soybean, vegetables, vineyards, etc.)

110 or 220 ft buffer

Roundup Ready® 2 Xtend Soybean

3 to 10 mph

Susceptible Crop (RR soybean, LL soybean, conventional soybean, Enlist soybean, vegetables, vineyards, etc.)

Sensitive Area (field edge, grass strip, tree line)

Corn

How do I control pigweeds in this buffer?

Applicators are solely responsible and liable for off-target movement!

I strongly support the use of dicamba for resistance management in the burndown

As the season progresses, the risk increases (vegetables, fruits, ornamentals, vineyards)

If you are going to spray dicamba, remember that Engenia was tested by university weed scientists across the U.S.

Why Glufosinate?

- Controls glyphosate-resistant and dicamba-resistant weeds
- Greater efficacy than dicamba
- More flexible than dicamba with less restrictive guidelines (no buffers, wider array of tank-mixes, fewer application requirements, easier tank cleanout, etc.)
- Less risk to damage your neighbor's crop